

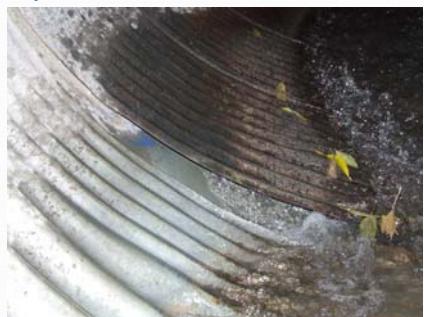
Visual Inspection

- Ovalinity
- Deflection



Visual Inspection

- Ovalinity
- Deflection
- Piping



Sliplining

- Ultraflow Properties
 - 18"-102" dia.
 - Segmental
 - 20 ft sticks
 - Low Profile
 - $\frac{3}{4}$ " Spiral Corrugations
 - Mannings "n" 0.012
 - Prefabricated bends



Filling Annular Space

- Structural Stability
- Required Piping
 - Bypass
 - Grout Tube (2)
 - Pressure Relief
- Flootation
 - Lifts (>36" dia.)
 - Spacers

**BEWARE OF
POINT LOADING**



BULKHEADS



BULKHEADS

- Cleanout



Cementitious Grout

- Specifications
 - Max Compressive Strength 250 psi



Cementitious Grout (Watered Down Concrete)

- Specifications
 - Low Density Grout
 - Max Compressive Strength 250 psi
- Grout Pressures
 - Pipe vs Joint structural limitations
- Lifts



High Density Polyurethane Foam

- Properties
 - Density: 2.5 pcf vs. 150pcf pcc
 - Compressive Strength: 35 psi vs 3000 psi pcc.



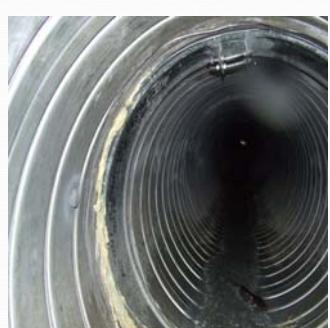
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- Properties
 - Density: 2.5 pcf vs. 150pcf pcc
 - Compressive Strength: 35 psi vs 3000 psi pcc.
 - Expands twelve times its liquid volume
 - Will not absorb water
 - Environmentally inert



Lessons Learned

- Segmental Pipe
 - Profile changes and deflection
- Joints
 - Internal banding
- Grout
 - Pressures
- Preparation
 - Bulkheads
 - Environmental
 - Communication



I-15 Now, Fold and Form

- Eight 24" RCP
- 2300 ft
 - ~288 ft



I-15 Now, Fold and Form

- Criteria
 - 50 yr design life
 - Joint separation
 - Cracks
 - Embankment height
 - Pipe diameter



Fold and Form

- Properties
 - 4"-30" dia.
 - Continuous
 - (no joints)
 - Cured in place
 - (no annular space)
 - Mannings "n" 0.010
 - Capable of bends



Fold and Form

- Pneumatic plug with steam and air supply line



Lessons Learned

- Temperature is critical
- Pull rate critical



Inspect Your Culverts!

